Hydrology

Summary

For the proposed action, the analysis was conducted within the Lower, Middle, and Upper Marble Creek (LMU) drainages. The analysis was based on a 5 to 20 year recovery timeframe. Within five years, surface infiltration and surface erosion concerns should be mitigated as herbaceous vegetation reestablishes on hillslopes, road cut and fill slopes, and drainage ditches. Within 5 to 20 years, hillslope stability, snow ablation rates, runoff timing, and water yield concerns should be mitigated as tree canopies and root networks are reestablished.

The baseline (past and present) cumulative effect Equivalent Clearcut Area (ECA) acreage is 23,659 acres which is 36 percent of the LMU Marble Creek drainages. With the implementation of the proposed action, the cumulative effect ECA acreage is 24,859 acres which is 38 percent of the LMU Marble Creek watersheds, a 2 percent increase over the existing baseline conditions.

Using the Forest Plan (Appendix D) Watershed Disturbance modeling approach, the ranking for ECA remain unchanged with the implementation of the proposed action when compared to baseline conditions within the LMU. Based on ECA modeling, no detectable increases, beyond existing variability, in peakflows would be expected from the LMU Marble Creek Watersheds. Based on Pfankuch stream surveys, no issues were observed or identified as being attributed to existing ECA peakflow events. Based on stream surveys, the only noted concern was elevated sediment deposition in Shearer Creek due to road surface runoff and a scouring culvert outlet on FR321. The road surface runoff and culvert scouring will be addressed with design features and BMPs during road maintenance activities (Appendix D: Design Features by Resource).

Using the Forest Plan Watershed Disturbance modeling approach, the ranking for road density, stream crossing frequency, crossing density, and intersect frequency remained unchanged with the implementation of the proposed action. The construction and maintenance of roads could result in sediment escaping the road buffer. This would be expected to be a short-term concern peaking immediately following completion of the proposed road construction activities and decreasing incrementally to no effect within 1 to 5 years. Based on GIS analysis of stream crossing density, the LMU received a high ranking. To mitigate this concern, design features have been incorporated into the proposed action. In addition, 27.8 miles of roads will be decommissioned resulting in an annual road generated sediment reduction of 20 tons.

Based on Idaho Department of Environmental Quality (IDEQ), no stream within the Homestead project boundary is rated as “not supporting” in the 2014 (final) or 2016 (draft) 305(b) integrated report. Within the LMU, Marble Creek is 305(d) listed by the IDEQ but not 303(d) listed by the EPA for not supporting temperature. Through the implementation of the INFS (USDA 1995) and the incorporation of Riparian Habitat Conservation Area (RHCA) into the Homestead project area, the proposed activities would not further degrade water quality with respect to temperature because RHCA would retain the canopy cover that prevents solar inputs to the stream. Also, the proposed habitat restoration within Marble Creek will improve water temperature concerns by adding structures to improve shading, pool scouring to add depth, and channel narrowing to improve overhead vegetative cover.

Effects to Hydrology

Direct and Indirect Effects

A comparison between the existing baseline condition (past and present actions) and the proposed action (past, present, and foreseeable future) was conducted (PF: HYDRO-001: Hydrology Analysis Summary). Based on the Forest Plan Watershed Disturbance modeling approach, the ranking for road density, stream crossing frequency, crossing density, and intersect frequency remain unchanged with the implementation of the Proposed Action when compared to baseline conditions within the Lower, Middle, and Upper Marble Creek (LMU) drainages.

Water Quality and Quantity

Water quality refers to the physical, chemical, and biological composition of a given water body and how these components affect beneficial uses. Based on the 2014 final and 2016 draft recommendations, the segment of Marble Creek from the confluence with Hobo Creek to the St. Joe River is listed as impaired in the 305(b) by IDEQ integrated report, but not 303(d) listed by the EPA, for water temperature. A TMDL (water quality improvement plan) has been developed for this segment. Direct incoming solar radiation is the dominant energy input for increasing stream temperatures with shade, being the single most important variable to reduce this heat input (Gravelle and Link 2007, Krauskopf et.al. 2010). Of the proposed actions, timber harvest is the only activity that could potentially increase the amount of solar radiation reaching the streams. Through the implementation of the INFS (USDA 1995) and the incorporation of RHCA into the Homestead project area, the proposed activities would not further degrade water quality with respect to temperature because RHCA would retain the canopy cover that prevents solar inputs to the stream. Field reviews of project area streams documented dense, intact overstory. Gravelle and Link (2007), also found that the use of riparian buffers effectively negated the effects of timber harvest impacts on stream temperatures in the reaches directly below harvested areas. In addition, the habitat restoration of seven miles of Marble Creek included in the proposed action will improve water temperature concerns by adding structures to improve shading, pool scouring to add depth, and channel narrowing to improve overhead vegetative cover.

To evaluate current stream channel stability, a modified Pfankuch (Rosgen, 1996, 2006b) surveys were conducted on Little Daveggio and Daveggio and a general stream survey on Shearer Creek. The modified Pfankuch evaluates the upper banks, lower banks, and streambed conditions. Based on this criteria, the modified Pfankuch rating ranged from fair to good (PF: HYDRO:002). For Daveggio and Little Daveggio Creek, fair ranking were given for limited vegetative bank protection, overly wide and shallow channel, deposition, bottom substrate size distribution, limited aquatic vegetative cover on substrate, and/or scouring and deposition in pools. In Shearer Creek, elevated sediment deposition was observed during the survey. The sediment was attributed to road surface runoff and scouring at a culvert outlet which will be mitigated during road maintenance activities (Appendix D: Design Features by Resource).

Equivalent Clearcut Area (ECA)

Researchers have attempted to quantify the ECA method (or similar methodologies) in an attempt to evaluate watershed responses due to timber harvest. Thomas and Megahan (1998) summarized the ECA discussion well. “Given the complex nature of the effects of forest cutting and roads on streams, it is not surprising that the literature provides mixed messages about peak flow responses”. To evaluate potential impacts to streams located within the LMU drainage, ECAs were calculated for the Lower, Middle, and Upper Marble Creek drainages. The baseline (past and present) cumulative effect ECA acreage is 23,659 acres which is 36 percent of the LMU Marble Creek drainages. With the implementation of the proposed action, the cumulative effect ECA acreage is 24,859 acres which is 38 percent of the LMU Marble Creek watersheds, a 2 percent increase over the existing baseline conditions. Based on ECA modeling, no detectable increases, beyond existing variability, in peakflows would be expected from the LMU Marble Creek Watersheds. Based on Pfankuch stream surveys, no issues were observed or identified as being attributed to existing ECA peakflow events. This worst case analysis is based on “all” road construction and timber harvest occurring in year-one of the proposed action. In reality, road construction activities would precede timber harvest activities, timber harvest activities would occur in multiple years with subsequent hydrologic recovery.

Road Sediment

With proper best management practices (BMP) implementation, generated road surface sediment should be captured within the road right-of-way or within the adjacent forest litter layer (Seyedbagheri 1996, IDEQ 2016, Edwards et al. 2016). Typically, road surface runoff is transported and deposited in small drainage features never reaching the perennial streams. However, when a large rain or rain-on-snow event occurs, these deposited sediments could be mobilized and transported long distances. During these events, short-term impacts to surface water quality could result. The potential for short-term impacts would diminish incrementally to no effect within 1 to 5 years. In addition to BMPs, additional design elements have been added to the Homestead project to mitigate road surface sediment impacts from road surface sediment (EA, Appendix D: Design Features by Resource). Based on the aforementioned proposed mitigation, a net reduction of 20 tons annually would be expected with the implementation of the proposed action.

Cumulative Effects

To evaluate Watershed Disturbance Rating (WDR) for cumulative effects, the total ECA was calculated by combining the proposed timber treatments, existing and proposed road treatments, and past private land timber treatments. Based on the Forest Plan Watershed Disturbance modeling approach, the ranking for road density, stream crossing frequency, crossing density, and stream-road intersect frequency, and ECA would remain unchanged with the implementation of the Proposed Action when compared to cumulative effect baseline conditions within the LMU (PF: HYDRO-001 Hydrology Analysis Summary).